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THE GARM EXPEDITION

Yu. D. Bulanzhe

Continuing earthquake studies begun in 1945, the Geophysical Institute, in the summer of 1947, went to Obi-Garm, Tadzhik SSR with new instruments constructed in the Institute. These instruments included epicentral seismographs of D. P. Kirnos and D. A. Kharin, extensometers designed by N. V. Veshnyakov, and new types of tiltmeters designed by V. F. Bonchkovskiy.

The 1947 expedition included three geological squads. The squad supervised by I. Ye. Gubin mapped the basic tectonic dislocations on a large-scale and drew up detailed geological maps covering the most seismic regions of the Tadzhik SSR. The second seismogeological squad (chief, S. V. Medvedev; scientific supervisor, G. P. Gorshkov) inspected the aftereffects of the destructive earthquakes of Dzhelalabad, 2 November 1946, and of Andizhan, 2 June 1947.

One of the most interesting problems in orogeny is the establishment of the basic laws governing the distribution of the elements of inner structure in a folded stratum against a background of gross tectonic forms. The main purpose of this type of study on orogenic processes is to clarify the nature and direction of mass movement within seams. The third squad (chief, I. V. Kirillova; scientific supervisor, V. V. Belousov) was similarly engaged and investigated the argillo-calcite strata of the Upper Cretaceous and Paleogeneeras near the Vakhshskiy range.

Gravimetric studies were carried out to determine possible time variations in the gravitational field in connection with geodynamic processes in the earth's crust. One squad (director, Yu. D. Bulanzhe) determined, after 2 year's work, a high-precision pendulum point in Obi-Garm to obtain the dates of the initial epoch.

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By comparing the data obtained with measurements made after several years, or after heavy earthquakes gravitational variations in Tadzhikistan with respect to the Central Russian platform can be determined. Five pendular instruments were used in the measurements and a method for precision pendulum determinations was developed. The gravimetric squad made more than 100 determinations along lines intersecting the most actively seismic regions, e.g., the Peter I, Gissarskiy, Darvazskiy, and Karateginskiy ranges. The measurements clarified considerably existing ideas on local gravitational anomalies, and determined the form of the contact surface of crystallic rocks and young tertiary deposits. The last fact is of real interest, since most shallow-focus earthquakes presumably can be attributed to this contact surface.

The magnetic squad studied regional anomalies in the secular behavior of magnetic elements in connection with the seismic phenomena of the region. These observations were made at the suggestion of the Garm expedition by the Scientific-Research Institute of Terrestrial Magnetism, Main Administration of the Hydrometeorological Service, Council of Ministers USSR. The Garm expedition also made geodesic studies of residual deformations in the earth's crust, both secular and seismic.

These investigations included the study of the relative horizontal and vertical movements of the earth's crust. A level course extending 500 kilometers was selected for this purpose. The course intersected the main tectonic disturbances of the Tadzhik SSR. Datum points of various types were laid out at 4- or 5-kilometer intervals; the relative displacement of the datum points indicated the movement of the earth's crust.

It was very difficult to organize geodesic measurements for studying horizontal movements caused by the overthrust of Mesozoic strata of the inner arch of the Pamirs into the Paleozoic massif of the Gissarskiy range. For this purpose, a first-class triangulation series connecting the points Kulyab-Stalinabad-Ura-Tyube was laid out. Several high-precision traverses were also laid out. During this field trip, surveying and construction of centers on the Kulyab-Stalinabad link were completed and a preliminary survey of the traverses was made.

All geodesic works are being carried out by the Main Administration of Geodesy and Cartography, according to plans developed jointly with the geodesic group of the expedition (Professor V. V. Danilov and Yu. D. Bulanzhe). The expedition revealed the need for a well-equipped geophysical station to conduct stationary observations; namely, on seismometry, tilt variations of the earth's surface, deformation of the earth in the passage of seismic waves, micromagnetic variations of the terrestrial field, and periodic variations of the gravitational field etc.

To satisfy this requirement, the Garm expedition undertook the construction of a special horizontal tunnel in solid granite in one of the regions of Garm Oblast which is subject to frequent, intense earthquakes. The planned length of the tunnel is 30 meters, and several rooms for the necessary equipment will be located at the end of the column. Drilling has already begun and by the beginning of the next field trip the tunnel should be ready for use. The station, containing the registering equipment, and auxiliary and living spaces are to be built near the tunnel.

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